table shows the pressure developed by strong ammonia solutions exposed to different temperatures:

PRESSURE PRODUCED BY EXPOSING AQUA AMMONIA TO DIFFERENT TEMPERATURES.

The apparatus in which this test was made consisted of a cast-iron fitting piece with a pressure gauge and a mercury gauge attached. The relation of the liquor to the unoccupied space of the apparatus was the same as the relation of liquor in a tank car to the unoccupied space of the car. The apparatus was set in a water tank which was heated externally, and readings of the pressure gauge end of the mercury gauge made at every degree of temperature. The thermometer was placed in the aqua.

Experiment was carried to 120.2° F.

The rate of heating was 1° every six minutes.

The percentage of ammonia was 28.5, and the number of cubic centimeters aqua used was 2800.

°C.	°F.	Pounds pressure.	Inches mercury.	°C.	°F.	Pounds pressure.	Inches mercury.
23	73.4	2½	4½	37	98.6	10½	21¾
24	75.2	3	6½	38	100.4	11	22¾
25	77.0	4	7½	39	102.2	11½	23¾
26	78.2	4½	8¼	40	104	12	24¾
27	80.6	5	9¼	41	105.8	12½	25½
28	82.4	5	10¼	42	107.6	13	26¾
29	84.2	5	11¼	43	109.4	13½	27¾
30	86	6	12½	44	111.2	14	28¾
31	87.8	6½	13¾	45	113	14½	29¾
32	89.6	8	16	46	114.8	15	30¾
33	91.4	8	17½	47	116.6	15½	31¾
34	93.2	9	18¼	48	118.4	16	32¾
35	95	9½	19	49	120.2	16½	33¾
36	96.8	10	20½				

A NITROGEN APPARATUS.

BY J. A. WESENER.

Received November 20, 1901.

THE purpose of this apparatus, as illustrated and described herewith in detail, is to secure greater rapidity in the ordinary nitrogen estimation. The method adopted in this apparatus for estimating nitrogen is by distilling the alkaline mixture in a current of steam, using the same steam which makes the

distilled water in the laboratory. This apparatus has been in constant use in the Columbus Laboratories since last March.

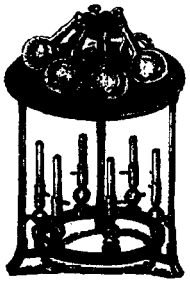
In point of accuracy, it is equal to the common prevailing method, while in rapidity it by far outclasses the old method. Ten minutes from the time the jet of steam is turned on is amply sufficient to expel all the ammonia in the product digested according to the official Kjeldahl method, and obtaining 250 cc. distillate in each flask.

The general description of the apparatus is as follows: The distillation flask is round-bottomed, and of 24 ounce capacity. In the neck of this flask is fitted a perforated rubber stopper, and flush with both ends a copper tube. To the upper end of this tube is fitted two hollow brass balls, the first and smallest being of about 40 cc., and the largest of 70 cc. capacity. Entering at the top of the first ball, and passing nearly to the bottom of the flask, is a thistle tube of glass, with a stop-cock. The object of this tube is to allow the alkali to be put in after the flask is connected with the condenser, and hence no ammonia is lost while connecting the apparatus.

From the side of the brass ball nearest the condenser leads a pipe of block tin tubing curving up to the second brass ball, which, as stated, is larger than the first. From this second ball a block tin tube leads again to the condensing coil, and is soldered in place at both ends. On the side of the first brass ball farthest from the condenser, at the junction of the ball with the tube, leading through the rubber stopper, is a small brass tube, 1/16 of an inch in diameter, with the joint at right angles, and joined to this is a glass tube which passes down below the surface of the liquid in the flask. Through this tube passes the steam for distillation. In the operation of the original apparatus, the steam is furnished from a boiler heated by steam coils, which is the source of the laboratory's distilled water.

In the apparatus as above described the operation is carried on as follows: The material is digested in a 24-ounce, round-bottomed flask, by using 15 cc. of concentrated sulphuric acid, plus a globule of mercury. After the digestion is complete, the flask is allowed to cool; is then diluted with distilled water, and connected to the apparatus. Sixty cc., which is the amount the cup in the thistle tube will hold, of 50 per cent. strength sodium hydroxide, is next added, the steam turned on, so as to mix the

alkali and acid, and then 20 cc. of the 4 per cent. potassium sulphide solution is added. The object of adding the potassium sulphide solution last is to avoid carrying over hydrogen sulphide in the distillate. The distillate is collected in ordinary 500 cc. flasks, in which a little distilled water is placed, so as to dilute the ammonia as it distils off.



I have found that no ammonia is lost by simply allowing the distillate to run in a flask containing distilled water, and therefore dispense with using standard acid solution. A trial of six ureas were digested according to the Kjeldahl method; three of the distillates were collected in decinormal sulphuric acid solution, and the other three were collected in distilled water, all titrated the same.

The steam pressure necessary to run a battery of six flasks briskly is 1 to 2 pounds. In case no steam is available in the laboratory, then a small copper boiler can be used, which being heated with one large gas-burner will furnish sufficient steam to run 6 flasks.

GOOD POINTS ABOUT THIS APPARATUS.

1. The material is digested in a 24-ounce round-bottomed flask, and therefore requires no transferring.

2. The operation is rapid. One 6-battery apparatus (which is the one illustrated) will make from 80 to 100 nitrogen distillations daily. The apparatus can be made up in duets, quartets, sextets, or any number desired.

3. No glass joints and rubber tubing, therefore no leaking.

4. Large saving of gas and time.

5. Economy of space. The 6-battery apparatus, when set up ready for use, requires a space of 24 by 24 inches only.

6. The apparatus can be run with one, two, or any number of the batteries up to the limit. Each battery being independent of the other, if one determination is completed before the others, it can be recharged without any interruption to the rest of the apparatus.

7. The apparatus can be used for water analysis, in which case the solution is boiled in the flask either by gas flame or with steam, which has been purified from ammonia. This purification can be accomplished by the addition of sulphuric acid and potassium permanganate.